

SUPERCEDES:

CITY OF HOUSTON FIRE PREVENTION BUREAU HOUSTON FIRE DEPARTMENT



LIFE SAFETY BUREAU (LSB) STANDARD 16 OPEN BURNING AND RECREATIONAL FIRES

HFD STANDARD 11-1 (5/21/99)

APPROVED BY:	DANIEL H. PRUITT ASSISTANT FIRE MARSHAL
	DATE: 5-23-03
APPROVED BY:	
	E. A. CORRAL FIRE MARSHAL
	DATE: 5- 25- 03
APPROVED BY:	
	CHRIS CONNEALY FIRE CHIEF
	DATE: 5-28-03

LSB STANDARD 16

OPEN BURNING AND RECREATIONAL FIRES

CONTENTS

SECTION 1 GENERAL	PAGI
1.1 Scope	4
1.2 Purpose	
1.3 Open burning prohibited	. 4
1.4 Discontinuance of open burning	4
SECTION 2 DEFINITION	
2.1 Open Burning	4
SECTION 3 BARBECUE PITS	
3.1 Permit not required	4
3.2 Barbecue pits indoors	
3.3 Barbecue pit outdoors	. 4
3.4 Barbecue pits used for burning trash	
3.5 Location to buildings	5
3.6 Disposal of ash and coals	5
SECTION 4 TRENCH BURNING	
4.1Compliance with TCEQ Texas Commission on Environmental Quality (TCEQ)	5
4.2 Permit required	5
4.3 Plot plan required	5
4.4 Permit at location	
4.5 Length of permit approval	. 5
4.6 Operation shut down	
4.7 Operation after dark	
4.8 Distance to exposures	
4.9 Ground opening	
4.10 Trench size	
4.11 Operating hours	
4.12 Added material	
4.13 Blower operation	
4.14 Material to be burned	
4.15 Material height in trench	
4.16 Removal of ash	
4.17 Operating instructions	
4.18 Trench burner operator	
4.19 Wind speed	
4.20 Weather stagnation advisories and Burn Bans	
4.21 Burning inside Loop 610	
4.22 Fire Dispatcher notification	. 7

SECTION 5 BONFIRES	PAGE
5.1 Compliance with TCEQ	7
5.2 Permit required	7
5.3 Plans	
5.4 Distance to exposure	
5.5 Time limit	
5.6 Wind speed	
5.7 Size of bonfire	
5.8 Materials for bonfire	
5.9 Prohibited materials for bonfires	
5.10 Approved combustibles and quantities	
5.11 Bonfire supervision	
5.12 Fire protection	
5.13 Bonfire extinguishment	
5.14 Debris removal	
5.15 Fire Dispatcher notified	8
5.16 Air Quality Control notified	
5.17 Weather stagnation advisories and Burn Bans	8
SECTION 6 CAMPFIRES	
6.1 Compliance with TCEQ	8
6.2 Permit required	
6.3 Plans required	9
6.4 Distance to exposures	9
6.5 Containment of campfire	
6.6 Campfire supervision	
6.7 Fire protection	
6.8 Wind speed	
6.9 Prohibited Materials for campfires	
6.10 Debris removal	
6.11 Fire Dispatcher notified	
0.11 File Dispatcher nounted	9
SECTION 7 FIRE WALKING	
7.1 Compliance with TCEQ	9
7.2 Permit required	9
7.3 Plans required	
7.4 Standby firewatch required	10
7.5 Distance to exposures	10
7.6 Fire walking coals	
7.7 Fire protection	. 10
7.8 Wind speed	. 10
7.9 Prohibited Materials for fire walking	
7.9 Profilibiled Materials for the walking	
7.11 Fire Dispatcher notified	10
SECTION 8 OPEN FLAMES-TORCHES	
8.1 Permit required	
8.2 Plans and permit required	11
8.3 Torches using natural gas	11
8.4 Flammable liquids	11

	PAGE
8.5 Regulated orifice	11
8.6 Gas pressure	
8.7 Height of burner	
8.8 Torch protection	
8.9 Torch location	
0.5 1010110000001	
SECTION 9 OPEN FLAMES (CANDLES)	11
9.1 Candles and Other Open-Flame Decorative Devices	
9.1.1 General	
9.1.2 Candles and other open-flame decorative devices	
9.1.3 Religious ceremonies	
9.1.4 Theatrical performances	
9.1.5 General precautions for candle use	
7110 College Processing for California and Californ	
SECTION 10 OPEN FLAME (FOOD PREPARATION)	13
10.1 General	. 13
10.2 Dispensing	
10.3 Containers not in use	
10.4 Serving of flaming food	
10.5 Location	
10.6 Fire protection	
10.0 The protection	13
REFERENCES	14
REFERENCES	14

LSB STANDARD 16

OPEN BURNING AND RECREATIONAL FIRES

SECTION 1 --- GENERAL

1.1 Scope.

Open burning and recreational fires within the corporate limits of the City of Houston shall be in accordance with the City of Houston *Fire Code* and this standard.

1.2 Purpose.

This standard is for the use and guidance for approved open burning and recreational fires.

1.3 Open burning prohibited.

All open burning within the City of Houston shall be prohibited unless approved by the Fire Marshal and a permit issued.

1.4 Discontinuance of open burning.

The Fire Marshal is authorized to require that open burning be immediately discontinued (permitted or otherwise) if it is determined that the emissions are offensive to occupants of surrounding property or if the open burning is determined to constitute a hazardous condition.

SECTION 2 --- DEFINITION

2.1 Open Burning.

'Open burning', for the purpose of this standard is the burning of: a bonfire, rubbish fire, campfire, trench fire, or other fire in an outdoor location where fuel being burned is not contained in an approved incinerator, outdoor fireplace, barbecue grill or barbecue pit.

SECTION 3 --- BARBECUE PITS

3.1 Permit not required.

Permits are not required for barbecue pits indoors or outdoors.

3.2 Barbecue pits indoors.

Barbecue pits used for commercial cooking in buildings shall be constructed as commercial food heat-processing equipment in accordance with the *Mechanical Code*.

3.3 Barbecue pit outdoors.

Portable and stationary barbecue pits outdoors shall be constructed of concrete or other approved noncombustible material.

3.4 Barbecue pits used for burning trash.

Barbecue pits shall not be used for the burning of trash, rubbish, or discarded leaves and branches.

3.5 Location to buildings.

Portable barbecue pits, charcoal grills and other open-flame cooking devices outside of a building shall not be operated on combustible balconies or located within 10 feet of combustible walls or roofs or other combustible materials.

3.6 Disposal of ash and coals.

Hot ash and coals from barbecue pits and charcoal burners shall be placed in a non-combustible container until cooled or thoroughly saturated with water, before being disposed of.

SECTION 4 --- TRENCH BURNING

4.1 Compliance with TCEQ.

Trench burning shall be in accordance with this section and written permission from the Executive Director of the TCEQ. If there is a conflict in regulations, the more restrictive shall apply. Compliance with TCEQ rules does not indicate automatic approval for a Houston Fire Department 'Open Burning' (Trench) Permit.

4.2 Permit required.

A permit is required for 'Open Burning' (trench burning) within the City of Houston. There will be an extra charge for special handling if the permit has a requested effective date of less than 4 working days after the date of application or where an inspection must be conducted at a specific time of day during working hours. Permits shall be obtained at the Houston Fire Department Permit Section, 1205 Dart Street (off of Houston Avenue); Telephone: (713) 247-8557.

4.3 Plot plan required.

A Plot Plan of the proposed 'Open Burning' (trench burning) site containing the address of the site, length, width, and depth of the property, location of the trench on the property, distance to building exposures, and length, width, and depth of the trench shall be submitted with the permit application.

4.4 Permit at location.

An approved 'Open Burning' permit shall be at the site any time burning is in progress.

4.5 Length of permit approval.

'Open Burning' (trench burning) shall only be approved for 90 continuous days at a time, including permanent sites, and a renewal application for burning shall be submitted for each 90-day period.

4.6 Operation shut down.

The trench burning operation shall be shut down if wind direction or other atmospheric conditions cause the operation to become a nuisance or hazardous to the public or it is determined that emissions are offensive to occupants of surrounding property. The operation shall be shut down upon the order of any fire or police officer. Failure to do so shall result in the permit being revoked.

4.7 Operation after dark.

There shall be no open burning operations after nightfall. Any operation after dark shall void the fire department permit and shall result in the permit being revoked.

4.8 Distance to exposures.

No site nearer than 600 feet to any school, residence (apartment, condominium, etc.) or medical facility shall be approved. Trench burning shall be operated at least 300 hundred feet from any recreational area,

residence or other structure not occupied or used solely by the owner of the trench burner or the owner of the property upon which the trench burner is located.

4.9 Ground opening.

The trench shall be opened in undisturbed soil not previously excavated, built up, compacted, or used in any type of landfill operation.

4.10 Trench size.

The trench shall be no wider than 12 feet with a minimum depth of 10 feet. The maximum length of the burning area as measured along the bottom of the trench shall not exceed by more than 5 feet the length of the manifold. The walls of the trench must be maintained such that they will remain vertical.

4.11 Operating hours.

Operation of the trench burner is limited to the hours between 8:00 a.m. and 6:00 p.m. (daylight hours only) and is limited to a total of 8 hours per day and 1,000 hours per year. A written record or log of the hours of operation of the trench burner shall be maintained at the burn site and made available at the request of Fire Marshal.

4.12 Added material.

Material shall not be added to the trench and debris shall have been consumed to ash residue by sunset or 6 p.m.

4.13 Blower operation.

The blower shall remain on until all material is consumed so that any remaining material in the trench will not smoke when the blower is turned off or the material shall be completely extinguished.

4.14 Material to be burned.

Material not being consumed by the fire and material being stock piled to be burned at a later date must be kept at least 75 feet from the trench. If water is not available for firefighting, this distance shall be increased to 200 feet.

4.15 Material height in trench.

Material shall not be added to the trench in such a manner as to be stacked above the air curtain at any time.

4.16 Removal of ash.

Ash generated by this operation shall be removed from the trench as often as necessary in order to maintain the minimum trench depth of 10 feet. The ash shall be removed in such a manner as to minimize becoming airborne. All material removed from the trench must be completely extinguished before being land filled or placed in contact with combustible material to prevent combustion outside of the trench or in the land fill.

4.17 Operating instructions.

Operating instructions provide in this standard for the trench-burning device shall be posted at the burn site and all operators shall read and have knowledge of these instructions. The operating instructions shall be made available at the request from the Fire Marshal.

4.18 Trench burner operator.

The trench burner operator shall remain with the trench burner at all times when the burner is in operation.

4.19 Wind speed.

Trench burning operations shall not be operated when surface wind speed is predicted to be less than 6 miles per hour or greater than 23 miles per hour.

4.20 Weather stagnation advisories and Burn Bans.

Burning shall not be conducted during periods of actual or predicted persistent (12 hours or more) low-level atmospheric temperature inversions (non-surface based) or in areas covered by a current county 'Burn Ban' warning, or State or National Weather Air Stagnation Advisory.

4.21 Burning inside Loop 610.

Trench burning operations are prohibited from location inside of Loop 610.

4.22 Fire Dispatcher notification.

The operator of the trench burner must notify the Fire Department Communication Center Dispatch Supervisor before and at the end of each burning operation. Telephone: (713) 222-7643

SECTION 5 --- BONFIRES

5.1 Compliance with TCEQ.Bonfires shall be in accordance with this section and the TCEQ. If there is a conflict in regulations, the more restrictive shall apply. Compliance with TCEQ rules does not indicates automatic approval for a fire department 'Open Burning' (Bonfire) Permit.

5.2 Permit required.

Application for 'Open Burning' (Bonfire) permit shall be made to the fire department at least 7 days prior to the date of the bonfire or an extra fee must be paid. Permits shall be obtained at the Houston Fire Department Permit Section, 1205 Dart Street (off of Houston Avenue); Telephone: (713) 247-8557. Additional fees and standby personnel and equipment may be required by the Fire Marshal in accordance with the *Fire Code*.

5.3 Site Plans.

Site Plans showing the exact location of the bonfire indicating the distances to buildings and other exposures shall be submitted with the permit application.

5.4 Distance to exposure.

The minimum distance of the bonfire to the nearest building or other exposure (fences, autos, etc.) shall be at least 300 feet.

5.5 Time limit.

Bonfires shall be limited to 1-hour duration.

5.6 Wind speed.

Wind speeds at the time of the bonfire shall not exceed 23 miles per hour.

5.7 Size of bonfire.

The overall size of the bonfire shall not exceed 12 feet in height, 12 feet in width, and 12 feet in length or 1728 cubic feet of area.

5.8 Materials for bonfire.

Combustible materials shall not be moved onto the premises before 7:00 am on the date of the bonfire.

5.9 Prohibited materials for bonfires.

Use of flammable or combustible liquids, auto tires, waste oil, asphalt roofing and asphalt waste, creosoted materials, or any other hydrocarbon derivatives and highly combustible materials such as paper, excelsior, wood shingles and cardboard boxes are prohibited from use in a bonfire.

5.10 Approved combustibles and quantities.

Combustible liquids such as kerosene, diesel fuel, etc. may be used for igniting the bonfire. A maximum of 5 gallons of said combustible liquid, if stored in an approved metal safety container, may be kept on the premises for this purpose.

5.11 Bonfire supervision.

The bonfire shall be supervised by at least one responsible adult, and the said adult's name and title shall appear on the permit.

5.12 Fire protection.

Approved portable fire extinguishers with minimum 4A ratings, or a garden hose of sufficient length and connected to an approved water supply, shall be provided within 35 feet path-of-travel distance to all sides of the bonfire.

5.13 Bonfire extinguishment.

The bonfire shall be completely extinguished before the site is left unattended.

5.14 Debris removal.

Debris resulting from the bonfire must be removed from the premises within 24 hours.

5.15 Fire Dispatcher notified

The Houston Fire Department Communications Center shall be notified on the evening of the burning, at least one hour prior to the burn; Telephone: (713) 222-7643.

5.16 Air Quality Control notified.

The City of Houston Bureau of Air Quality Control shall be notified on the evening of the burning.

5.17 Weather stagnation advisories and Burn Bans.

Bonfires shall not be conducted during periods of actual or predicted persistent (12 hours or more) low-level atmospheric temperature inversions (non-surface based) or in areas covered by a current county 'Burn Ban' warning, or State or National Weather Air Stagnation Advisory.

SECTION 6 --- CAMPFIRES

6.1 Compliance with TCEQ.

Campfires shall be in accordance with this section and the **TCEQ**. If there is a conflict in regulations, the more restrictive shall apply. Compliance with TCEQ rules does not indicate automatic approval for a Fire Department Open Burning (Campfire) Permit.

6.2 Permit required.

Application for a permit for 'Open Burning' (campfire) shall be made to the fire department at least 7 days prior to the date of the campfire, or an extra fee must be paid. Permits shall be obtained at the

Houston Fire Department Permit Section, 1205 Dart Street (off of Houston Avenue); Telephone: (713) 247-8557.

6.3 Plans required.

A drawing of the campfire site indicating the location of the campfire or campfires shall be submitted with the permit application.

6.4 Distance to exposures.

The location of the campfire shall not be within 25 feet from any structure or combustible exposures such as fences, automobiles, trailers and trees.

6.5 Containment of campfire.

The campfire shall be contained in a metal container not to exceed 36 inches by 36 inches and the sides not less than 24 inches high. Wood shall not be stacked above the sides of the container at any time during the campfire.

6.6 Campfire supervision.

The campfire shall be attended at all times by a responsible adult knowledgeable in the use of the fire extinguishment required by this section. The campfire shall be fully extinguished before the site is left unattended.

6.7 Fire protection.

An approved portable fire extinguisher with a minimum 4A rating, or a garden hose of sufficient length and connected to an approved water supply, shall be provided within 35 feet path-of-travel distance to each campfire.

6.8 Wind speed.

Wind at the time of or during the campfire shall not exceed 23 mph.

6.9 Prohibited Materials for campfires.

Use of flammable or combustible liquids, auto tires, waste oil, asphalt roofing and asphalt waste, creosoted materials, or any other hydrocarbon derivatives and highly combustible materials such as paper, excelsior, wood shingles and cardboard boxes are prohibited from use in campfires.

6.10 Debris removal.

Debris resulting from the campfire must be removed from the premises within 24 hours.

6.11 Fire Dispatcher notified.

The Houston Fire Department Communications Center shall be notified at least one hour prior to the burn; Telephone: (713) 222-7643.

SECTION 7 --- FIREWALKING

7.1 Compliance with TCEQ.

Firewalking shall be in accordance with this section and the TCEQ. If there is a conflict in regulations, the more restrictive shall apply. Compliance with TCEQ rules does not indicate automatic approval for a Fire Department 'Open Burning' (Firewalking) Permit.

7.2 Permit required.

Application for a permit for 'Open Burning' (Firewalking) shall be made to the fire department at least 7 days prior to the date of firewalking, or an extra fee must be paid. Permits shall be obtained at the Houston Fire Department Permit Section, 1205 Dart Street (off of Houston Avenue); Telephone: (713) 247-8557.

7.3 Plans required.

A drawing of the firewalking site indicating the location of the firewalking shall be submitted with the permit application. Permission from the owner of the property must be secured specifically in writing before the permit can be approved.

7.4 Standby firewatch required.

A Standby firewatch paid for by the person conducting the firewalk will observe the activity to verify that the activity is conducted safely. The standby firewatch shall remain on site until such time the coals are completely extinguished. A Standby firewatch permit application shall be submitted with 'Open Burning' permit application and plans in accordance with the *Fire Code*.

7.5 Distance to exposures.

The location of the firewalking shall not be within 25 feet from any structure or combustible exposures such as fences, automobiles, and trailers.

7.6 Firewalking coals.

The coals for firewalking shall be contained in an approved container of metal construction with sides at least 4 inches high or in the ground at least 4 inches deep. The height of the coals shall not extend above the side of the containment.

7.7 Fire protection.

An approved portable fire extinguisher with minimum 4A ratings, or a garden hose of sufficient length and connected to an approved water supply, shall be provided within 35 feet path-of-travel distance to the firewalk area.

7.8 Wind speed

Wind at the time of or during the firewalk shall not exceed 23 mph.

7.9 Prohibited Materials for firewalking.

Use of flammable or combustible liquids, auto tires, waste oil, asphalt roofing and asphalt waste, creosoted materials, or any other hydrocarbon derivatives and highly combustible materials such as paper, excelsior, wood shingles and cardboard boxes are prohibited from use in firewalking.

7.10 Debris removal.

Debris resulting from the firewalk must be removed from the premises within 24 hours.

7.11 Fire Dispatcher notified.

The Houston Fire Department Communications Center shall be notified on the evening of the burning, at least one hour prior to the burn; Telephone: (713) 222-7643.

SECTION 8--- OPEN FLAMES (TORCH DEVICES)

8.1 Permit required.

No person shall install, erect or maintain any open flame torch for aesthetic or decorative value on any premises within the City of Houston unless a permit is obtained for the installation or erection of such

from the fire department Permit Office. Permits may be obtained at the Houston Fire Department Permit Section, 1205 Dart Street (off of Houston Avenue); Telephone: (713) 247-8557.

8.2 Plans and permit required.

Before beginning the installation or erection of any open flame torch in the city, (natural gas or combustible liquids) an applicant must submit a permit request to the fire department Permit Office, and include a plot plan showing the location of torches and their proximity to buildings, vegetation and other combustibles, driveways, parking areas, streets, and walk ways. Cut away drawings of the device and the method of installation must be submitted.

8.3 Torches using Natural Gas.

Devices utilizing Natural Gas shall be installed by a licensed plumber and shall have the installation of the device and piping permitted and approved by the City of Houston Building Department, Plumbing Section.

8.4 Flammable liquids.

Flammable liquids, including Liquefied Petroleum Gas (LPG), shall not be used for open flame torches.

8.5 Regulated orifice.

A regulated orifice shall be placed within the supply line of each torch of such size to prevent a flame of over 18 inches in height above the burner outlet when the valve is fully open (including Natural Gas or combustible liquids).

8.6 Gas pressure.

Gas shall be delivered to the device at a pressure not greater than the pressure normally provided for by the building department permitted installations.

8.7 Height of burner.

The height of the bottom of the burner of the torch shall be at least 8 feet above the ground level.

8.8 Torch protection.

Torches adjacent to streets, parking areas, driveways, or walkways shall be curbed or otherwise barricaded to prevent mechanical damage.

8.9 Torch location.

Torches shall not be located closer than 10 feet to any street, parking area, driveway, or walkway and shall not be installed closer than 10 feet to any building or combustible material including vegetation, shrubbery, banners, decorations or similar materials.

SECTION 9 --- OPEN FLAMES (CANDLES)

9.1 Candles and Other Open-flame Decorative Devices.

9.1.1 General.

The use of candles and other open-flame decorative devices shall be in accordance the *Fire Code* and this standard. Permits and standby firewatch may be required by the Fire Marshal for public assembly activities, events and theatrical performances where candles and other open-flame devices are to be used. Information and permits may be obtained at the Houston Fire Department Permit Section, 1205 Dart Street (off of Houston Avenue); Telephone: (713) 247-8557.

9.1.2 Candles and other open-flame decorative devices.

The use of candles and other open-flame decorative devices in places of public assembly and drinking or dining establishments shall be in accordance with the *Fire Code* and this standard:

- 1. Classes I and II flammable liquids and LP-gas shall not be used.
- 2. Liquid- or solid-fueled lighting devices containing more than 8 ounces must self-extinguish and not leak fuel at a rate of more than 1/4 teaspoon per minute if tipped over.
- 3. The devices or holder shall be constructed to prevent the spillage of liquid fuel or wax at the rate of more than ½ teaspoon per minute when the device or holder is not in an upright position.
- 4. The device or holder shall be designed so that it will return to the upright position after being tilted to an angle of 45 degrees from vertical.

Exception: Units that self-extinguish if tipped over and do not spill fuel or wax at the rate of more than 1/4 teaspoon per minute if tipped over.

- 5. The flame shall be enclosed except as follows:
 - 5.1 Openings on the side shall not be more than 3/8 inch diameter.
 - 5.2 Openings on the top and the distance to the top shall be such that a piece of tissue paper placed on the top will not ignite in 10 seconds.
- 6. Chimneys shall be made of noncombustible materials. Such chimneys shall be securely attached to the open-flame device.

Exception: The chimney need not be attached to any open-flame device that will self-extinguish if the device is tipped over.

- 7. Fuel canisters shall be safely sealed for storage.
- 8. Storage and handling of combustible liquids shall be in accordance with *Fire Code*.
- 9. Shades, if used, shall be made of noncombustible materials and securely attached to the open-flame device holder or chimney.
- 10. Candelabras with flame-lighted candles shall be securely fastened in place to prevent overturning and located away from occupants using the area and away from possible contact with drapes, curtains or other combustibles.
- **9.1.3 Religious ceremonies.** When, in the opinion of the Fire Marshal, adequate safeguards have been taken, participants in religious ceremonies are allowed to carry handheld candles. Handheld candles shall not be passed from one person to another while lighted.
- **9.1.4 Theatrical performances.** When approved, open-flame devices used in conjunction with theatrical performances are allowed to be used when adequate safety precautions have been taken.

9.1.5 General precautions for candle use.

Candles and open flame decorative devices should not be placed on or near combustible materials, including table or desk tops, and should be placed so as not to be subject to accidental overturning. Flame tips should not reach beyond lip of container or holder. Candles not within a container or holder shall be safeguarded from accidental contact with, or hot wax spillage onto, any combustible materials.

SECTION 10 – OPEN FLAME (FOOD PREPARATIONS)

10.1 General.

The preparation or use of flaming foods or beverages in places of public assembly and drinking or dining establishments shall be in accordance with standard.

10.2 Dispensing.

Flammable or combustible liquids used in the preparation of flaming foods or beverages shall be dispensed from one of the following:

- 1. A 1-ounce unbreakable container, or
- 2. An unbreakable container not exceeding 1-quart capacity with a controlled-pouring device that will limit the flow to a 1-ounce serving.
- 10.3 Containers not in use. Containers shall be secured to prevent spillage when not in use.
- **10.4 Serving of flaming food.** The serving of flaming foods or beverages shall be done in a safe manner and shall not create high flames. The pouring, ladling or spooning of liquids is restricted to a maximum height of 8 inches above the receiving receptacle.
- **10.5 Location.** Flaming foods or beverages shall be prepared only in the immediate vicinity of the table being serviced. They shall not be transported or carried while burning.
- **10.6 Fire protection.** The person preparing the flaming foods or beverages shall have a wet cloth towel immediately available for use in smothering the flames in the event of an emergency.

REFERENCES

- 1. City of Houston Fire Code, International Fire Code, 2000 edition, as amended.
- 2. City of Houston Building Code, all editions.

Conversion factors: 1 inch = 25 mm; 1 foot = 305 mm

1 ounce = 30 ml; 1 quart = 947 ml